Pine Mountain Late-Successional Reserve
Habitat Protection and Enhancement Project

Fisheries Biological Evaluation (BE)

Upper Lake Ranger District, Mendocino National Forest Service

Project Location:

Township 17 North, Range 10 West, Sections 2-5 and 8-10
Township 17 North, Range 11 West, Section 12
Township 18 North, Range 10 West, Sections 20, 25-29, 32-35
Township 18 North, Range 11 West, Sections 24, 25, 35 and 36

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Summary of Determinations

Species/Habitat	Status	Determination
SONCC Coho salmon ESU*Oncorhynchus kisutch (Walbaum)*	T	MANLAA
SONCC Coho salmon ESU Critical Habitat	XP	MANLAA
CC Chinook salmon ESU *Oncorhynchus tshawytscha* (Walbaum)	T	MANLAA
CC Chinook salmon ESU Critical Habitat	XP	No Effect
NC Steelhead trout*Oncorhynchus mykiss* (Walbaum)	T	MANLAA
NC Steelhead trout Critical Habitat	XP	No Effect
Delta smelt*Hypomesus transpacificus*	T	No Effect
Vernal Pool fairy shrimp *Branchinecta lynchi*	T	No Effect
Pacific Lamprey *Entosphenus tridentatus*	S	MANLAA
Western Brook Lamprey *Lampetra richardsoni*	S	MANLAA
Clear Lake Hitch *Lavinia exilicauda chi*	S	No Effect
Hardhead*Mylopharodon conocephalus*	S	No Effect

T=Threatened, S=Sensitive, XP=Proposed Critical Habitat

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I. Introduction:

The purpose of this biological evaluation (BE) is to determine the effects of the implementation of the Pine Mountain Late-Successional Reserve Habitat Protection and Enhancement Project on endangered, threatened, proposed, candidate species and their critical habitat, as listed by the U.S. Fish and Wildlife Service (revised 3/1/2015). This BE also considers potential effects on the sensitive species from the Regional Forester's sensitive species list. This analysis was prepared in accordance with Forest Service Manual (FSM 2670) direction and the Endangered Species Act (as amended).

The project is located on the Upper Lake Ranger District within the Mendocino National Forest in Lake County, California. The project is located in portions of Township 17 North, Range 10 West, Sections 2-5 and 8-10, Township 17 North, Range 11 West, Section 12, Township 18 North, Range 10 West, Sections 20, 25-29, 32-36 and Township 18 North, Range 11 West, Sections 24, 25, 35 and 36. The project area is contained completely within the Van Arsdale Reservoir, Lake Pillsbury, Potter Valley and Elk Mountain USGS 7.5 minute quadrangle maps. Elevations in the 10,200 acre project area range between 1,548 feet and 3,971 feet.

Species listed in Table 1 were considered for analysis because they are federally listed as threatened, endangered, proposed, candidate species or had designated critical habitat.

Table 1: Endangered, Threatened, Proposed, Candidate species and their designated critical habitat in the project area.

Species/Habitat	Status	Project within species distribution range (Y/N)	Habitat in or near project area (Y/N)	Species present (Y/N)	Effects	Determination
SONCC Coho salmon ESU*Oncorhynchus kisutch (Walbaum)*	T	Y	Y	N	Indirect	MANLAA
SONCC Coho salmon ESU Critical Habitat	XP	Y	Y	N	Indirect	MANLAA
CC Chinook salmon ESU *Oncorhynchus tshawytscha* (Walbaum)	T	Y	Y	Y	Indirect	MANLAA
CC Chinook salmon ESU Critical Habitat	XP	Y	N	N	None	No Effect
NC Steelhead trout*Oncorhynchus mykiss* (Walbaum)	T	Y	Y	Y	Indirect	MANLAA
NC Steelhead trout Critical Habitat	XP	Y	N	N	None	No Effect

The project area is within the distribution range and habitat is present for the **SONCC Coho salmon, CC Chinook salmon** and the **NC Steelhead**; therefore, these species will be further discussed in this analysis, and the effects of proposed actions on these species and their critical habitat will be considered.

Species listed in table 2 were considered for analysis because they are listed in the Regional Forester's sensitive species list for the Mendocino National Forest.

Table 2: USDA Forest Service,Pacific Southwest Region, Mendocino National Forest, Regional Forester's sensitive fish species.

Species	Status	Project within Distribution Range (Y/N)	Habitat in or near project area (Y/N)	Species present (Y/N)	Effects Determination	
Pacific Lamprey*Entosphenus tridentatus*	S	Y	Y	N	I	MANLAA
Western Brook Lamprey*Lampetra richardsoni*	S	Y	Y	N	I	MANLAA
Clear Lake Hitch *Lavinia exilicauda chi*	S	N	N	N	None	No Effect
Hardhead *Mylopharodon conocephalus*	S	Y	N	N	None	No Effect

Species were not further considered for analysis in this document if:

1) The project is not within the distribution range of a species, **Clear Lake Hitch** (Moyle, 2002).
2) Habitat and/or species are not present in project area, **Hardhead** (Moyle, 2002).

II. Consultation to date

A list of Endangered and Threatened species and their habitat was obtained from the Sacramento U.S. National Marine Fisheries Service office website (http://www.fws.gov/sacramento/es/spp_lists.htm) on January 18, 2016, covering the USGS 1:24,000 Lake Pillsbury quadrangle. It considers information from the National Marine Fisheries Service (NMFS) listing of species and Critical Habitat (CH) under the Endangered Species Act (ESA); consideration of Forest Service Sensitive (FSS) fish species; and past reports and surveys specific to the project area. The species identified on this list were considered in this analysis (Table 1).

An updated list was generated from the same office on September 25th 2016, with no changes in identified listed species or their designated critical habitat.

On July 22, 2016, a draft BA was sent to Tom Daugherty, NMFS, with a request for technical assistance to finalize mitigations and project design features.

On July 29, 2016, Tom Daugherty, NMFS, contacted the Upper Lake district Fisheries biologist with a request for additional information.

On October 27, 2016, Tom Daugherty, NMFS, met with Upper Lake district fisheries biologist in Upper Lake, CA, to finalize mitigations and project design features. An agreement on project design features was reached to minimize impacts to anadromous fish habitat from the implementation of the Pine Mountain Project.

III. Current Management Direction

Current management direction is based on the guidance documented in the Mendocino National Forest, Land and Resource Management Plan (LRMP), dated February, 1995 and the subsequent Record of Decision (ROD) dated July 1996. The Mendocino National Forest LRMP describes standard and guidelines that would be incorporated into the project design. Management requirements would also incorporate Best Management Practices (BMPs) relevant to this particular project, as described in the Water Quality Management for Forest System Lands in California – Best Management Practices (USDA, 2000).

On June 20, 1997, NMFS issued a Biological Opinion for the MNF Land and Resource Management plan (LRMP), and on April 16, 2001, NMFS sent a letter of response to re-initiate consultation on the LRMP. The Biological Opinion for the LRMP identified “Reasonable and prudent measures” on page 55, and terms and conditions on page 58 requiring the Forest to utilize the Level 1 team consultation process and apply the NMFS Checklist and Matrix of Pathways and Indicators (NMFS, 1996) to evaluate all proposed activities that may affect listed, proposed or candidate species of Pacific salmonids. Term and condition 2b on page 59 states: “to facilitate the ESA consultation process and ensure agreement on effects determinations, utilize the Level 1 process and apply the NMFS’ Checklist and Matrix of Pathways and indicators (NMFS, 1996) to determine whether proposed actions are either “May Affect, Not Likely to Adversely Affect” or “May Affect, Likely to Adversely Affect” listed, proposed, or candidate species of the Pacific salmonids. The NMFS Checklist and Matrix of Pathways and Indicators were used to evaluate the effects of the proposed actions on the anadromous habitat in or near the planning area.

IV. Description of Proposed Action

Alternative 1 – No Action

No activities would take place in the action area under the “no action” alternative. The current management of the area would continue into the future with no changes. No actions would result in the continued build up fuels on the forest floor, which could increase the risk of catastrophic wildfires in the

project area. This alternative would also allow the continued increase in stand density, which could also increase the risk of catastrophic wildfires by retaining conditions that allow for a crown fire to move from tree to tree. This alternative would not address the high occurrence of ladder fuels that promote fire to climb into the canopy and lead to crown fires, which can destroy a given stand of timber. The implementation of the "no action" alternative would not meet project objectives.

Alternative 2 – Proposed Action

The following is a summary of the Proposed Action for the Pine Mountain Late-Successional Reserve Habitat Protection and Enhancement Project. A complete detailed description of the project Proposed Action can be found in Chapter two of the Environmental Impact Statement (EIS):

The Mendocino National Forest, Upper Lake Ranger District, proposes to conduct fuels reduction and habitat enhancement treatments on approximately 7,830 acres southwest of Lake Pillsbury in the Pine Mountain vicinity. The Planning Area is 10,200 acres in size and comprises both Late Successional Reserve (LSR) and Matrix land designations. Of the approximately 7,830 acres to be treated, ~5690 acres are within the Pine Mountain LSR and ~2,140 acres are in Matrix lands. The project emphasizes fuel reduction activities and habitat management for the protection and enhancement of late-successional species. The project area was chosen for treatment based on past fire history and the existing conditions that pose a threat to late-successional habitat.
The Pine Mountain LSR is one of the smaller LSRs within the Forest and provides a link between the Blue Slides LSR seven miles to the southeast and the Sanhedrin LSR, 1.25 miles to the north. This LSR also provides a critical link to State and other Federal lands to the south and west. This area is currently part of Northern Spotted Owl Critical Habitat (Unit 11, Subunit ICC 5), a designated land allocation by US Fish and Wildlife Service, and also includes 1.6 miles of critical habitat for anadromous fish. These habitats are located within both the LSR and matrix lands. The Project Area is located approximately 15 miles north of the town of Upper Lake, primarily in T18N, R10W, and portions ofT18N, Rll W; Tl7N, R10W; and Tl7N, Rll W, Mount Diablo Base Meridian. (See Map).
Treatments are being designed to accomplish the following Purpose and Need objectives:

1. Reduce the risk to late-successional habitat loss from wildfire through vegetative treatments designed to modify and restore characteristic fire regimes and forest structure.

2. Improve forest health, vigor, and resilience to fire, insects and disease as well as enhance the diversity of plant and animal habitat found within the project area while restoring and enhancing late successional habitat.

3. Manage National Forest lands (including roads and trails) to meet the Aquatic Conservation Strategy Objectives and direction set forth in the Mendocino National Forest Land and Resource Management Plan (LRMP).

The Proposed Action includes the following treatments to achieve the desired condition:

- Fuel treatments may be applied as prescribed fire only or as a combination of prescribed fire with mechanical treatments, piling and pile burning.

- Mechanical treatments will include mastication or thinning of trees. Thinning of trees less than 10 inches in diameter at breast height (dbh) will be implemented by Forest Service personnel or through service contracts. Thinning of trees greater than 10 inches dbh will be implemented through a commercial contract. These treatments are intended to achieve ecological objectives such as restoring a fire-resilient stand structure, managing for open habitat (that includes shrubs and hardwoods), hastening the development of desired late successional stand characteristics in plantations as well as accelerating the development and vigor of larger trees outside plantations. Treatments would reduce competition between trees for onsite resources such as moisture, light, nutrients and growing space; and would reduce overly dense stand conditions which have led to declining stand health and uncharacteristic fire regimes.
- Prescribed fire treatments will be applied in chaparral areas, following direction provided by the LRMP, to create a mosaic of age classes which provides for the development of heterogeneous chaparral habitat and interruption of fuel continuity.
- Prescribed fire treatment will be applied in forested areas with excessive accumulations of natural fuels, following direction provided by the LRMP.
- Shaded fuel breaks will be constructed following direction provided by LSR Assessment to provide a buffer against fires originating from the west and moving eastward with the prevailing winds. The fuel breaks will also assist in prescribed fire activities.

Other proposed activities include road management such as road maintenance, drainage improvement, road decommissioning, temporary road construction and rehabilitation, and non-system trail closures. The Interdisciplinary Team is developing design features and Best Management Practices to protect water, wildlife, aquatic, archaeological, cultural, and botanical resources. Refer to the Table of Proposed Actions below which includes the proposed treatment acreage and mileage. **Table of Proposed Action**

Proposed Treatments	Proposed Action
Thinning <10 in. dbh and post-thinning prescribed fire	3760 acres
Thinning > 10 in. dbh and post-thinning prescribed fire	1650 acres
Prescribed fire within chaparral areas1	2420 acres
Shaded fuel break construction	9 miles
Use of existing undesignated roads2	3.9 miles
Reconstruction of existing undesignated roads2	0.58 miles
New temporary road construction3	0.25 miles
Designate non-system road as trail	0.3 mi.
Road decommissioning	0.3 mi.
Ghost road deletion2	0.4 mi.
Closure of non-system trails	17.6 mi.

1Not all 2420 acres will be burned. In order to create a mosaic of age classes burning would be conducted over several years and areas would be left unburned to maintain the oldest age class.
2These roads will be decommissioned after project completion.
3 Ghost Roads are roads that do not exist on the ground, but are delineated on maps; they are frequently

A compete detailed description of the individual unit prescriptions can be found in Appendix B.

Alternative 3 – Preferred Alternative (No new temporary road construction)

Actions proposed under this alternative would be the same as the Proposed Action (Alternative 2), with the exception of the ¼ mile of new temporary road construction. The Upper Lake Ranger District Interdisciplinary Team recommended this alternative as the preferred alternative of choice.

Alternative 4 – No thinning above 10" DBH in Riparian Reserves

This alternative is proposing the same actions as the Proposed Action (Alternative 2), with the exception of "no thinning above 10" DBH in the Riparian Reserves".

Alternative 5 – No thinning above 10" DBH in known Northern Spotted Owl nesting habitat

Actions proposed under this alternative would be the same as the Proposed Action (Alternative 2), with the exception of "no thinning above 10" DBH in known Spotted Owl nesting habitat.

V. Existing Environment

The Pine Mountain Late-successional Reserve (LSR) Enhancement Project aquatic habitat can be characterized as three watersheds; Bucknell Creek, Benmore Creek and Packsaddle Creek, of which Bucknell creek and Benmore creek drain directly into the lower Eel river below Scott Dam. A short section (6.5 miles) of the Eel river also has the potential to be indirectly affected by project activities, the section of the Eel river between the mouth of Bucknell creek and the mouth of Benmore creek (see table #1). Packsaddle creek drains into the Rice Fork arm of Lake Pillsbury above Scott dam.

The analysis area appears to contain habitat for three fish listed under the Endangered Species Act: Southern Oregon/Northern California Coast (SONCC) coho, Northern California (NC) steelhead, and California Coastal (CC) Chinook salmon. This habitat is in Bucknell and Benmore creeks and in the affected reach of the Eel River.

Additionally the analysis area appears to have habitat for two Forest Service Sensitive (FSS) aquatic species: the foothill yellow legged frog, and the Western pond turtle; this habitat is in Bucknell and Benmore creeks and in the Eel River. The analysis area may overlap habitat for FSS Pacific lamprey and western brook lamprey.

The eastern portion of the project lies in the Packsaddle subwatershed of the Rice Fork 5th field watershed, which drains into Lake Pillsbury and does not contain anadromous fish. Lake Pillsbury, formed by Scott Dam, is a PG&E managed water storage facility for hydroelectric power generation about 12 miles downstream at Van Arsdale. Lake Pillsbury, Rice Fork Creek, and some Rice Fork tributaries provide habitat for resident rainbow trout. Packsaddle Creek is fishless adjacent to the project, but is documented to contain habitat used by the non-native Sacramento pike- minnow near its confluence with Rice Fork Creek.

The western portion of the project lies within the Bucknell and Benmore subwatersheds of the Soda Creek 5th field watershed which is an anadromous watershed. Bucknell Creek and Benmore Creek which flow into the Eel River within the Soda Creek watershed provide designated critical habitat for Southern Oregon/Northern California Coast (SONCC) coho. Additionally Northern California (NC) steelhead have been documented in both of these streams, but the streams are not currently designated as critical habitat for steelhead. The Eel River also provides designated critical habitat for SONCC coho and the California Coastal (CC) Chinook salmon. Chinook carcasses and redds have been seen in the past in the lower portions of Bucknell Creek and Benmore Creek, but these tributary streams are not designated Chinook critical habitat. Coho salmon are only rare visitors to the Soda watershed, but it is possible that adult coho will stray into this watershed and spawn before the project is completed. However, while summer stream temperatures are cool enough for juvenile steelhead, they are higher than those preferred by coho for juveniles to over summer.

Two Forest Service Sensitive (FSS) fish species have been found in these watersheds: Pacific lamprey and western brook lamprey. Both Pacific and western brook lamprey in California are dependent on cool to cold water streams; lamprey larvae are documented as preferring water temperatures less than 20°C (68°F) and having metabolic problems at higher temperatures. Water temperatures of 22° C were found to cause death or deformation of eggs and ammocoetes in laboratory studies on Pacific lamprey (US Fish and Wildlife Service, 2008).

Pacific lamprey is an anadromous fish and can ascend waterfall barriers that block other fish, and it is possible that they could be found farther upstream than steelhead. However, the Cape Horn dam and the Van Arsdale fish ladder (which are about 6 miles downstream of closest portion of the project, and outside of the Forest Boundary) have limited Pacific lamprey passage for more than a century. It is possible that Pacific lamprey and western brook lamprey are present in some locations in Bucknell and Benmore creeks in some years, but no juveniles have been located to date.

Suitable habitat forall life stages of lamprey have been found in portions of the Eel River. Juvenile lamprey (ammocoetes) depend on sufficient accumulation of silt and fine sands for refuge. High stream

gradients and flushing flows do not allow the aggradation of fines that ammocoetes require. Marginally suitable juvenile lamprey habitat can be found in some years in the same streams that support steelhead in the Soda Creek watershed, but surveys show that suitable habitat in tributaries is very limited.

FSS western brook lamprey have been found in the Eel River below proposed project work and have been documented in Bear Creek of the Rice Fork watershed. 2015 surveys located western brook lamprey in Rice Fork near the mouth of Bear Creek. 2015 spring surveys generally failed to find suitable habitat for these fish due to lack of sufficient fines, except in the Eel River below Lake Pillsbury.

The headwaters of Packsaddle Creek lie within the project boundaries and this stream is a tributary to Rice Fork. No fish have been documented in Packsaddle Creek adjacent to the project, but nonnative Sacramento pike-minnow have been found in lower Packsaddle Creek and Rice Fork upstream and downstream of the project area. There is no suitable juvenile rearing habitat for western brook lamprey in Packsaddle Creek or the adjacent Rice Fork due to the high stream gradient and insufficient instream fines.

FSS foothill yellow legged (FYL) frogs are found within Eel River and the fish bearing reaches of Benmore, Bucknell, and Packsaddle Creeks, as well as upstream of fish barriers in the perennial streams. These frogs can be found in intermittent streams when sufficient water exists, but such use is limited, compared to the perennial streams. They are highly aquatic and rarely found more than a few feet from surface water. They typically breed in streams, but occasional adults can be found occupying small ponds in and adjacent to the project area. FYL frog adults prefer streams with at least some shade and riparian shrubs/ trees. FYL frog tadpoles prefer sunny stream reaches since warmer water and sunshine improves algae growth which they depend on for growth to metamorphosis. Adult FYL frogs are present, but not abundant in the perennial streams near the project. FYL tadpoles are common each summer in lower Benmore and Bucknell creeks.

FSS Western pond turtle are present in the Eel River, Lake Pillsbury, and lower gradient reaches of Benmore and Bucknell Creek. These lower gradient reaches roughly correspond to the reaches used for Chinook spawning and rearing. Western pond turtle (WPT) abundance is low adjacent to the project. No ponds capable of supporting WPT have been found within the project area, but at least one such pond exists on private land near the project. WPT prefer habitat with sunny banks, logs, and bedrock, for basking.

The Eel River below Lake Pillsbury contains the Asian clam (*Corbiculaflumenia*) which is a nonnative aquatic invasive species.

Habitat overview:

Table #1: Habitat length by species in project area.

Stream Name	Total Perennial Habitat Length in project area	Anadromous Habitat	Resident habitat	FYLF habitat	WPT Habitat	Intermittent & ephemeral Tributary Habitat
Benmore Creek	3.99 miles	2.50 miles	2.83 miles	3.25 miles	2.00 miles	8.59 miles
Bucknell Creek	5.62 miles	4.50 miles	5.62 miles	3.50 miles	1.50 miles	7.80 miles
Packsaddle Creek	17.75 miles	None	3.74 miles	3.00 miles	2.00 miles	5.24 miles
Eel River	6.50 miles	6.50 miles	6.50 miles	6.50 miles	6.50 miles	None effected by project activities
Totals	33.86 miles	13.50 miles	18.69 miles	16.25 miles	12.00 miles	21.63 miles

Riparian Reserves (RRs) and Streamside Management Zones (SMZs)

RRs and SMZs constitute a hierarchy of areas designated to protect water quality, aquatic, and riparian habitats (Figure 1). The highest level of protection occurs within the SMZ, where no mechanized equipment is allowed to operate except at designated crossings. Vegetation treatments are allowed within any of these zones but are subject to more stringent management requirements. Table 4 shows the number of acres of SMZs and RRs within the planning area.

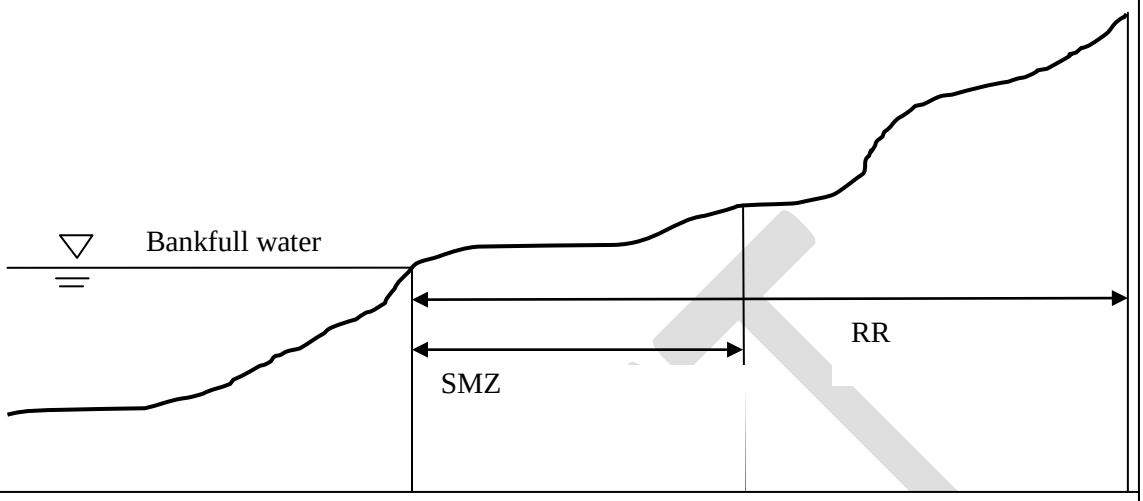
Table 4. Acres of SMZs and RRs within project area

	SMZ (acres)	RR (acres)
Perennial	225.4	676.4
Intermittent	711.45	2134.35
Ephemeral	939.16	4695.8

Riparian Reserves provide several functions that are important to watershed and aquatic health. They serve as filter strips to slow overland flow and trap sediment. While providing shade to regulate water temperature, they also provide for recruitment of Large Woody Debris (LWD) into the fluvial system. They can also provide micro-climates for habitat niches and connectivity corridors for wildlife. The majority of the Riparian Reserves within the Project Area are along intermittent streams and are composed of upland vegetation, with little to no phreatophytic vegetation present. As with the surrounding land areas, the vegetation is dense and fuel loads are very high.

Overall Riparian Reserves are 300 feet from the wetted width on both sides of the creek, for a maximum total of 600 feet on fish bearing perennial streams. Intermittent and ephemeral streams within the

action area will have Riparian Reserves of 100 feet on either side of the stream for a total riparian reserve of 200 feet. The SMZ and RR are illustrated below in figure 1.



SMZ width for each stream class:

- **Fish-bearing perennial**: the greater of 100 foot slope distance or to the slope break
- **Non-fish bearing perennial:** the greater of 50 foot slope distance or to the slope break
- **Intermittent:** the greater of 50 foot slope distance or to the slope break
- **Ephemeral:** 50 feet

Figure 1. Definition sketch for Riparian Reserves (RRs) and Streamside Management Zones (SMZs)

The Pine Mountain project area landscape is influenced by the underlying geology. The geology is known as the Franciscan Assemblage. The Franciscan is made up of metamorphosed sedimentary rocks, including fine grained siltstones and coarse grained greywackes. Blocks or stringers of other kinds of rock such as serpentinite occur within the Franciscan Assemblage. Because of the depositional and tectonic history of the Franciscan, most of its rock is sheared and broken. Broken up, weak rock mixed with California's earthquakes and rains or snow melt results in a landscape made up of deep-seated landslides. Most of these landslides are dormant and over four-hundred years old in age. However more recent failures, younger than four hundred years, are active landslides. Active landslides, per the Northwest Forest Plan and the Mendocino National Forest's Land Management and Resource Plan, are considered riparian reserves and must be managed to prevent human induced failures. These unstable riparian reserves, once identified, are no longer part of the standard land component thus excluding them from management actions that may have a deleterious effect. The Pine Mountain project area has an estimated 70 acres of known landslides within unit boundaries. Known and mapped dormant landslides make up 3,188 acres or almost 40% of all units (see unstable areas, Appendix A). Some of the dormant landslides have active areas as evidenced by consistently swooping or pistol butted trees and relatively youthful sags or closed basins on slide benches. Other locations where active landslides are very common are along the inner gorges. Inner gorges are those slopes 65% and above immediately

adjacent to streams. These are also considered unstable riparian reserves. Inner gorges form by rapid downcutting by streams which results in oversteepened, unstable banks that are prone to mass wasting.

No large active deep slides were identified in the project area; unstable areas found were mostly small slumps or ground exhibiting signs of creep. These areas were mapped and will be flagged for avoidance. Additional precautions include a 50 foot setback (buffer) from the top of an unstable area where no trees > 4 inches DBH will be removed and no mechanized equipment allowed. Skid trails and temporary roads will not be located on or within 50 feet from these areas, nor will cross drains drain onto them.

Benmore Creek:

Benmore creek is a second order stream with its mouth located at T18N, R10W, S21 on the Eel River. Benmore creek was surveyed by California Department of Fish and Game in 1998 from the mouth to the end of fish habitat for a total distance of 14,950 feet (2.83 miles). A short section 328 feet (0.06 miles) of the mid-section of Benmore creek was again surveyed in 2014 by the Upper Lake Ranger District hydrologist. The results of the two known surveys of channel conditions of Benmore creek are summarized below:

Benmore creek is dominated by two distinct Rosgen channel types, A4 (3,460 feet) and B4 (11,348 feet) channel types, which are both dominated by gravel substrate with a lesser amount of cobble and boulders with some fine sediment present. The A4 channel type is characterized by a relatively steep gradient (>10% gradient) usually located in a confined canyon with a low sinuosity rating (<1.2). The B4 channel type is characterized by a moderate slope (2-4% gradient) usually located in a moderately narrow canyon with a moderate sinuosity (>1.2). The suitability of these channel types for fish habitat improvement structures is excellent in the B4 channel type and good in the A4 channel types, which makes this stream a good candidate for future fish habitat improvement projects designed to increase pool habitat and spawning gravels.

Benmore creek meets the Eel river on a large alluvial floodplain which reduces the gradient of the stream to <1%. The low gradient in this area reduces stream flows and allows substrate to fall out of the water column and accumulate at the mouth of the creek. The high amount of aggregate at the mouth of the stream causes the flow to become sub-surface and prevents access to the stream by anadromous fish at certain times of the year (low flow). Access to the stream is limited for summer steelhead and late season spring Chinook during most years. Access to Benmore creek is dependent on the influx of water from large or sustained storm events and snow melt.

The surveys showed that the stream is comprised of less than half (47%) slow water habitats, with only 11% being pools >2.5 feet in depth. The remainder of the stream (53%) is characterized as fast water or riffles, runs, glides and special habitat units (chutes, cascades and waterfalls). Generally when pool habitat makes up less than 40% of the total length of the stream, pool habitat enhancement projects should be considered.

In small confined channel types the suitable spawning habitat is usually located at the pool tail-out, which is where gravel accumulates because of the reduced flow at this location. Fine sediment accumulations cause the gravel to become embedded and unusable for spawning. The higher the embeddedness rating the less usable the gravel becomes for salmonid spawning. An embeddedness rating of 1 indicates excellent spawning habitat, and an embeddedness rating of 5 are considered unsuitable for spawning. Excellent spawning habitat was located in only 6% of the pool habitat and 25% of the pool habitat was rated as good for a total of 31% of pool habitat in the good-excellent range. Spawning habitat in the low-poor quality range was located in 59% of the remaining pools and 10% were rated as unsuitable for spawning. The low quality and unsuitable ratings were usually attributable to large amounts of boulders, large cobble and the lack of large woody debris (LWD).

Water temperatures in 1998 measured from 50^{o} to 59^{o} F, and at the end of August 2015 the water temperatures were measured at 62^{o} F. Salmonids are known to have upper-lethal thermal limits of 20-24^{o} C, which equates to 68-78^{o} F. The observed temperature range in Benmore creek appears to be in amoderate range for salmonid fish species. Stream shading is the largest contributor to controlling water temperatures by preventing direct sunlight from reaching the water column. The stream canopy density was measured at an average of 72% in 1998 and again at 85% in 2014, which suggests that the canopy has become denser in the 16 years since the first survey. In general, revegetation projects should be considered when the canopy density falls below 80%.

Stream bank vegetation helps shade the water and control water temperature, and is also the main contributor of organic material to the stream, which drives production of macro-invertebrates. The stream bank vegetation was found to be low in 1998, with a measured percentage of 33% for the right bank and 37% for the left bank. A diverse population of macro-invertebrates were found in Benmore creek (stonefly, cranefly, caddisfly, salmonfly and midges), but the population appears to be small due to the lack of organic material and nutrients.

Benmore creek was shown to have a deficiency of LWD. LWD is a natural component of streams that shapes channel geometry, holds gravel from flushing, increases cover, as well as pool habitat and provides organic material and refuge for macro-invertebrates. In general the more LWD present in a stream can increase pool habitat, improve spawning gravel, increase macro-invertebrate populations and usually results in a more diverse habitat. Benmore Creek would benefit from the addition of LWD by holding more gravel, increasing pool habitat and the increase in macro-invertebrate population.

Bucknell Creek:

Bucknell Creek is a third order stream with its mouth located at T18N, R11W,S35 on the Eel River approximately 6.5 miles downstream of the confluence with Benmore Creek. Bucknell creek provides approximately 4.5 miles of anadromous habitat for NC steelhead and Pacific lamprey. The anadromous habitat ends at a natural barrier approximately 4.5 miles upstream and only resident trout are found

above this location. The fish habitat ends approximately 7.8 miles upstream from the mouth where the flow is reduced to less than 0.1 cfs and is subsurface in many areas.

Bucknell creek was surveyed by California Department of Fish and Game in 1995 from the headwaters near Elk Mountain downstream for 9,504 feet (1.8 miles). The results of this survey are summarized below:

Bucknell creek is characterized by B3 Rosgen channel type which is dominated by cobble and small boulder substrate. This channel type generally has a low-moderate gradient (2-4%) with a moderate sinuosity rating (>1.2). The stream channel is located in a steep V-shaped canyon.

The survey showed that the stream has a pool/riffle ratio of 70:30 (2.33) which is excellent. The average pool depth was reported to be approximately 3 feet with an overall stream depth average of 18 inches. Spawning gravel was found to be lacking with only 15% of the substrate falling into this category. The dominant substrate was found to be cobble with a sub-dominant of small boulder. Streambed gravel suitable for spawning was found to be very sparse, making up only approximately 2% of the survey area. The lack of gravel indicates a low spawning value for anadromous fish but the high amount of pool habitat shows the stream has high potential for rearing habitat for juvenile salmonids.

Water temperatures measured consistently 47^{o} F, which is excellent for cold water species such as steelhead and Chinook. The highest water temperature found was 50^{o} F in a section of open canopy, but this section was small and not the normal conditions found throughout this stream reach. Canopy cover was found to be high (90%) which helps to limit water temperature and provides overhead cover. The canopy consisted of willow, alder, bigleaf maple, live oak, black oak, manzanita, dogwood, thimbleberry, hazelnut, horsetail, columbine and wild raspberry. The transition zone to the upland provides a change to conifers, mainly Douglas-fir and Ponderosa pine. The vegetation type and quantity was found to be consistent throughout the survey area. The overall streamside vegetation was found to be dense to abundant throughout the survey area.

The survey results showed a low density of macro-invertebrates in the survey area. The reason for the low population of invertebrate food sources is unknown. Local agricultural activities on private land have been known to effect water quality in the past which allowed fertilizer to enter the stream. The addition of fertilizer in the stream can cause elevated levels of filamentous algae and can also lead to nitrogen poisoning of fish, and limit insect production. The local agricultural activities are also expected to be responsible for altering summer stream flow and limiting access for anadromous fish at a critical time (low flow). Unauthorized water diversions on National Forest System lands have been addressed in this watershed in the past, but the US Forest Service has no authority over activities occurring on private lands within the watershed. Employee safety concerns due to private agriculture activities have prevented any survey efforts in Bucknell creek for over a decade; therefore new information or data collection has not occurred.

Like Benmore creek, the mouth of Bucknell creek is choked with a build-up of aggregate which limits anadromous fish access to the creek during low flows. The stream itself showed a lack of good spawning gravel which suggests the stream is not retaining its' gravel, which is likely due to the lack of LWD. The stream was rated as poor for suitable spawning gravel by CDFW, with only 2% of the substrate comprised of suitable spawning habitat, but the stream was found to be valuable for juvenile salmonid rearing habitat.

Packsaddle Creek:

Packsaddle Creek is a second order stream located above Scott Dam at T18N, R10W, S25 on the Rice Fork arm of Pillsbury reservoir. This stream provides no anadromous habitat and is thought to be fishless, although Sacramento pike-minnow have been observed in the lower section of Packsaddle creek (below fish barrier) and Rice Fork near the project area. The middle reaches of packsaddle creek provide limited habitat for Foothill yellow-legged frog, and the lack of fish in this stream increases the quality of the available amphibian habitat. The stream also provides moderate habitat for the WPT in the middle reaches were it contains suitable deep pool habitat.

No survey of habitat conditions has been conducted in Packsaddle creek, so the conditions in this stream are based upon field observations and historical knowledge. Packsaddle creek is a large truncate stream system with several tributaries branching out from the main channel. The watershed covers approximately XXX acres and drains into Lake Pillsbury above Scott Dam. The upper headwater areas of tributaries and the main channel lack surface flow from approximately June until the influx of water from storms in the fall. The reduced flow causes pools to lose connectivity and limit migration of aquatic organisms preventing them from avoiding predation or desiccation.

The packsaddle stream system was visited in August and September of 2015 by Upper Lake Ranger District, Fisheries biologist to assess the quality and quantity of aquatic habitat, the results are summarized below:

The tributary streams that feed the flow of packsaddle creek originate from known previously identified springs and seep areas. In 2015 these springs were found to be dry which result in dry headwater stream reaches. No residual pools were found in these upper headwater stream reaches within the tributaries of Packsaddle creek, which indicates there is no suitable habitat for FYLF or WPT in these tributaries. The main stem of Packsaddle creek does have residual pools that can support both the FYLF and WPT; however, these pools are shallow (<2 feet) and have no connectivity due to lack of surface water. The lack of connectivity and shallow nature of these pools indicate poor quality habitat for FYLF and WPT.

Project Elements

The following Project Elements (PE), activities within the proposed action that are considered for analysis, were used for this effects analysis.

PE-1: Vegetation Management

PE-2: Fuels Treatment

PE-3: Road Use and Maintenance

Action Area: Effects from the identified PEs will be considered only in the anadromous habitat within or near the project area. This includes the following river reaches:

- Benmore Creek – mouth to River mile 2.5
- Bucknell Creek – mouth to River mile 4.5
- Mainstem Eel River confluence of Bucknell to confluence of Benmore – 6.5 miles

Table #5: Affected acres of anadromous habitat

Watershed	Watershed acres	Approx. Acres in project area	Affected acres	Percent Watershed affected
Bucknell Cr.	11,647	3,358	3358	29% total acres
Benmore Cr.	3414	3414	2151	63% total acres

The remainder of the project area is either disconnected from anadromous habitat by Scott dam, or no actions are proposed that would affect anadromous habitat; therefore, this area will no longer be considered for analysis in this assessment. Mainstem Eel River is located more than ½ mile from any proposed activities, and a road lies between any proposed actions and the river; therefore, expected effects to the mainstem Eel River should be discountable.

The following analysis is concentrated on effects to the affected acres of Bucknell creek and Benmore creek as described in Table #5, exclusively.

Table #6 below shows the affected acres in each watershed by proposed treatment types. The table shows the treatment prescriptions are spread out over a very large area, and no one watershed is heavily impacted. Thinning units and Mechanical Fuels treatment units are the treatments that use heavy equipment and cause the most ground disturbance. These treatments are proposed to occur on 15% and 14% of the anadromous watershed acres in the project area. Hand thin fuel treatment units and burn only units are proposed to occur on 18% and 23% of anadromous watershed acres, respectfully. The affected acres are also spread out between the three anadromous watersheds, with Benmore having the most acres affected (10%) and the mainstem Eel River having the least acres affected (2%), within the action area.

The lower impact treatments (Hand-thin and burn only) units affect more acres (18% and 23%, respectfully) than the higher impact treatments listed above. Bucknell Creek has the majority of the low impact treatments proposed to occur with 23% of the watershed being affected. This is due to the large brush fields that are proposed to be burned on the north bank of the watershed.

Table #6: Affected Acres by Treatment Type

Watershed	Thinning units	Percent of Affected Acres	Mechanical Fuels Treatment units	Percent of Affected Acres	Hand Thin Fuels Treatment units	Percent of Affected Acres	Burn Only	Percent of Affected Acres
Benmore Creek	770 acres	10%	67 acres	1%	742 acres	9%	0	0%
Bucknell Creek	229 acres	3%	925 acres	12%	395 acres	5%	1824 acres	23%
Eel River	156 acres	2%	125 acres	1.50%	251 acres	3%	0	0%
Total Anadromous	1159 acres	15%	1117 acres	14%	1388 acres	18%	1824 acres	23%
Non-Anadromous/ Packsaddle Creek	495 acres	6%	466 acres	6%	940 acres	12%	445 acres	5.50%
Total affected acres	1650 acres	21%	1583 acres	20%	2328 acres	30%	2269 acres	29%

Design Features

Design features will be incorporated into the proposed action to ensure that project activities do not result in adverse effects to water quality or aquatic habitat in the action area. The following design features apply to Pine Mountain Late-Successional Reserve Habitat Protection and Enhancement Project:

Aquatic Design Features for all actions:

- Heavy equipment (dozers, etc.) will be limited to slopes less than 35%. Use of heavy equipment on slopes up to 40%, for a distance of 100 feet is allowed.
- Any water bars installed post-harvest and damaged by fuels activities, will be repaired before the next precipitation event.
- Mechanical operations would occur during dry soil conditions, which is usually between May 15th and October 15th. If weather permits, an extension of operating period may be imposed through October, to help meet project objectives. Implementing this operating period should minimize soil compaction and reduce the potential for increased erosion.
- On road cut-slopes steeper than 70% slope and higher than 10 feet. No trees >8 inches DBH will be harvested from the cut-slope or within 20 feet of the upper edge of the cutbank.
- Several small land-slides and slump areas were identified in the project area (see geology report). These unstable areas will be flagged and avoided and no thinning of trees >4 inch DBH will be allowed within 50 feet of the top of the unstable area.
- Retain at least 50% ground cover (litter/duff/rock) within all treatment areas.

Aquatic Design Features for Riparian Reserves:

- Retain all riparian obligate vegetation within the Riparian Reserves.
- Tractor piling is prohibited within the Riparian Reserves on slopes >25%; however, mastication or grapple piling is allowed outside of the SMZ in the RR on slopes <35%.
- On slopes <50% retain at least 50% ground cover (litter/duff/rock) across the treatment unit.
- On slopes >50% retain at least 70% ground cover (litter/duff/rock) across the treatment unit.
- Bare soil areas of greater than 50 sq. ft. would be covered with mulch or slash to the appropriate cover percentage as listed above.

Aquatic Design Features for Streamside Management Zones (SMZ):

- No ground based mechanical equipment or commercial harvest is allowed in SMZ. Temporary crossing of intermittent or ephemeral streams will be pre-approved by the district hydrologist prior to implementation. Only existing controlled stream crossings (bridges/culverts) of perennial streams will be allowed.
- Within SMZ only <10 inch DBH trees would be cut on a spacing of 20-25 foot distance. No trees >4 inch DBH would be cut in the inner 10 feet of the SMZ.
- Retain all riparian obligate hardwood vegetation.
- Maintain a canopy cover of 70% in all RR and SMZ in the project area.
- Retain 70% ground cover (litter/duff/rock).
- Bare soil areas greater than 50 sq. ft. would be covered with slash or mulch if the area is likely to produce sediment.

Aquatic Design Features for Commercial Thinning:

- Use only existing skid trails and landings.
- Uphill skidding would be allowed on slopes up to 35% and sections shorter than 100 feet would be allowed on slopes up to 40%.
- Soil displacement >4 inches in depth would be back bladed or waterbarred to prevent soil erosion or sedimentation.
- Harvest Units would not be occupied by more than 15% of the unit in skid trails and landings.
- Temporary stream crossings would be removed and stabilized prior to the wet season (October 15).
- No commercial harvest is permitted in the SMZ.

Aquatic Design Features for Fuels Treatment:

- Prescribed fire is designed to result in a low to moderate intensity fire.
- In units previously harvested the mastication/shredding equipment would use only existing travel ways in each unit.
- Masticators should walk on slash as much as possible.
- Soil displacement of greater than 4 inches in depth would be graded and water-barred to prevent erosion or sedimentation.
- No heavy equipment will be allowed in the SMZ of fish bearing portions of Benmore or Bucknell creeks.
- No equipment use or tree removal would be allowed in unstable areas.
- No tree >8 inches DBH would be removed within 25 feet of the inner gorge of Benmore Creek.
- No ignition would occur in the RR, SMZ or unstable areas. Fire would be allowed to back into these areas; however, high intensity fire may require active suppression efforts.
- Fire would not be allowed within 300 feet of the anadromous portions of Benmore or Bucknell Creeks.

VI. Effects of the Proposed Actions

Watershed Condition Indicator (WCI) analysis summary:

Population characteristics indicators were not considered relevant to this project due to the small scale of actions (10,200 acres) compared to the overall size of the affected watershed (Eel River). This analysis identified the following watershed indicators that may be affected by this project:

Non-watershed Condition Indicators:

- Suspended sediment/turbidity

- Temperature
- Streambank condition

Watershed Condition Indicators:

- Road density and location
- Disturbance history
- Riparian Reserves

The potential for effects are defined below:

Discountable – an action that would have no detectable change to a resource.

Negligible – an action that may cause a change to a resource, but the change would be so small that it would not be of any measurable consequence to the resource and would cause no impairment to the resource.

Minor – an action that may cause a change to a resource, but the change would be small and if measurable, it would result in a small and localized consequence, but would not cause impairment of the resource.

Moderate – an action that would cause some change to a resource and the change would have a definite and measurable consequence, but is localized in the extent of the impact (confined to a small area). Moderate impacts have the potential to slightly impair the resource.

Major – an action that would cause a definite change to a resource and the change would be readily measurable and would have a substantial consequence to the resource. Major impacts may be significant and could result in resource impairment.

Threatened, Endangered, Proposed and Candidate species:

Anadromous: NC Steelhead trout, CC Chinook salmon and SONCC Coho salmon:

Alternative 1 (No Action)

A. Direct and Indirect Effects

Fuels treatments:

Alternative 2 is the “no action” alternative and this means that no fuels treatments would be implemented. No prescribed fire would be performed to reduce fuel loads, which may result in an increase in overall fuel load in the planning area. No hand piles would be built or lit near Benmore Creek allowing fuels to increase in the riparian area. No direct or indirect effects would occur to anadromous fish or their critical habitat from implementation of the “no action” alternative for Fuels treatments.

Alternative 2 is the “no action” alternative and this means the current fuel load would persist into the future. A continued recruitment of fuel would allow the fuel load to increase and elevate the risk of a catastrophic wildfire to occur. A large scale fire with areas of moderate and high severity post-burn conditions could result in significant changes to riparian and stream habitats. These changes include loss of riparian vegetation, loss of canopy cover and the denuding of ground cover that may lead to increased erosion and sedimentation. A high intensity fire in the project area could result in an increase in sedimentation and changes in the riparian habitat that could reduce/not change the habitat suitability for many years (5-10). High severity fires that burn with high temperatures and to a greater extent across the landscape remove vegetative cover and often leave bare mineral soil that is vulnerable to erosion and sedimentation (Arkle and Pilliod, 2010). Compared to the proposed action, the risk of impact to riparian vegetation and instream habitat from a wildfire would be higher because of the continued increase in the fuel load. Implementation of this alternative would not meet project objectives for fuels treatments.

Vegetation Management:

Implementation of the “no action” alternative would result in no direct or indirect effects to anadromous fish or coho critical habitat. No timber would be removed and no heavy equipment would be used for timber operations; therefore, no direct or indirect effects would occur from vegetation management in the Action Area.

Under the “no action” alternative the timber within the planning area would continue to grow and the stand density would continue to increase, which could increase competition and decrease stand vigor. Implementation of the “no action” alternative would not meet the project objectives for vegetation management.

Road Use and Maintenance:

Implementation of the “no action” alternative would result in no direct or indirect effects to anadromous fish or their critical habitat because no actions would occur and the area would continue under the current OHV and vehicle use.

If the HCS road segments in the project area are not repaired, they will continue to deliver sediment to the streams in the Action Area. This would mainly occur in Benmore Creek and to a lesser extent in Bucknell Creek, based on the existing number of road miles associated with each watershed. Existing gullies and rills would be expected to increase, thereby accelerating sediment delivery to stream channels. Unstable banks associated with failed culverts would not be restored through culvert replacement, and thebanks would continue to erode and deliver sediment to the watershed.

A potentially worse outcome is the failure and overtopping of plugged culverts, which could result in the loss of road fill directly into the stream. This type of event can result in a localized reduction in habitat quality as pool volume is reduced and the stream becomes embedded from fine sediment.

Alternative 2 (Proposed Action)

A. Direct and Indirect Effects

Fuels treatments:

Fuels treatments in the Pine Mtn. project area are not directed at excluding fire, but rather at improving landscape resilience to fire events by having fuelbeds that are within the natural range of variability (see proposed action). Approximately 7830 acres (76% of project area) are proposed for prescribed fire treatments (see map appendix A). Thinning of trees may occur in units when necessary to modify fire behavior and assist in holding fire lines.

There would be no ignition of fire in close proximity to Benmore or Bucknell creeks. Prescribed fire is proposed along approximately ½ mile of the north side of Bucknell Creek and 1 ½ miles of the east side of Benmore Creek (see map, Appendix A).

The following management requirements apply to prescribed fire:

- No direct ignition within 300 feet of perennial streams or 150 feet of intermittent streams, but allow the fire to back into the riparian reserve.
- No handline construction within 100 feet of perennial or intermittent streams, or 50 feet of ephemeral streams, except when there is no alternative to meet objectives.
- Maintain 75% ground cover within 100 feet of perennial streams and within 50 feet of intermittent and ephemeral streams.
- Burn piles will not be built or ignited closer than 50 feet from a perennial stream or 25 feet from intermittent and ephemeral streams.
- Maintain flame lengths of 4 foot at the 90th percentile fire weather conditions.

Prescribed fire is proposed along approximately ½ mile of the north side of Bucknell Creek (11% total length) which is located along the final portion of anadromous habitat. Fire is also proposed to be introduced along the last 1 ½ mile of the east side of Benmore Creek, mainly above the available

anadromous habitat (see map, Appendix A). The desired result of the prescribed fire is a mosaic burn type close to the creek with low burn severity and unburned areas dominating. There may be some localized impacts to individual or groups of riparian trees, but the loss of riparian vegetation is expected to be negligible.

Beche et al., 2005, found that prescribed fire affected only 4.4% of the riparian vegetation even when ignited within the RCA. Arkle and Pilliod, 2010, found no statistically significant change in stream shading from a prescribed fire in which ignition was excluded from the riparian area and where allowed to back into the riparian vegetation. The proposed action requires flame lengths of 4 feet which is less than the 5 foot flame lengths used by Beche et al., 2005. Therefore, it is expected that the effects from the proposed action would be less or similar to what he reported. The effects of prescribed fire on anadromous habitat in Benmore and Bucknell Creek is expected to be negligible.

Prescribed fire actions that could lead to an increase in sedimentation are fireline construction, building and ignition of handpiles and the fire itself. Construction of firelines removes surface vegetation and exposes bare mineral soil, which can lead to erosion and sedimentation. Dozer and handlines would not be allowed closer than 100 feet from Benmore and Bucknell Creeks, except under limited circumstances. The lack of treatment within 100 feet would interrupt the connectivity between the fireline and the aquatic feature and assimilate any sediment generated. Also, implementation of BMPs would further reduce the risk for excessive sedimentation into the watersheds. Ground cover requirements further minimize the potential sediment created by limiting the amount of bare ground that is vulnerable to erosion. Fire line rehabilitation includes installing waterbars and covering bare ground with leaf litter. This helps limit erosion by reducing the amount of erodible fireline length and increasing ground cover.

No burn piles would be built or ignited closer than 300 feet from Benmore and Bucknell Creeks. Burn piles occupy a small area (6-10 feet diameter) and the distance from habitat should be adequate to assimilate sediment generated from the erosion of the burnpile footprint.

Part of this analysis relies on the effective implementation of BMPs. Prescribed fire BMPs were evaluated on the Stanislaus National Forest for their effectiveness in 2006 and 2010. The effectiveness was evaluated on ten separate fires of varying size. Prescribed fire BMPs were found to be effective in minimizing or avoiding impacts to water quality in all ten cases. Regional BMP monitoring summary also showed an effectiveness rating of 100% for prescribed fire BMPs (USDA Forest Service, 2012).

High severity fires that burn with high temperatures and to a greater extent across the landscape remove vegetation, cover and often leave bare mineral soil that is vulnerable to erosion (Arkle and Pilliod, 2010). Arkle and Pilliod, 2010, also showed that higher intensity fires can result in increases in sedimentation and also take longer to recover (up to 15 years) from the disturbance. The proposed action would involve a low intensity fire within the riparian reserves that is designed to give a mosaic pattern, with unburned areas between the burned areas. The unburned areas and the low intensity burn should retain adequate ground cover to minimize erosion and avoid subsequent sedimentation.

There is some risk that sediment could be delivered to the streams from the burn area but it is expected to be minor, due to the low intensity fire and retention of adequate ground cover (75%) following the burn. Arkle and Pilliod, 2010, found no increases in fine sediment following a prescribed burn when ignition did not occur in the riparian, and the fire was allowed to back into the riparian. Beche et al., 2005, found no statistical difference in fine sediment measures even when ignition occurred in the riparian area. Conditions observed in these two studies are expected to be similar to the prescribed fire outcomes predicted for this project.

There is a low risk of prescribed fire activities delivering fine sediment to the streams in the Action Area; however, it is expected to be minor. Restrictions within RCAs, effectiveness of BMPs, adequate ground cover retention and low intensity fire should further reduce sedimentation from prescribed fire.

There is a chance that a prescribed fire may burn at a higher intensity than is expected and this can cause a reduction in canopy cover. This is expected to occur on a very limited basis where fuel accumulations are high (i.e. "Jackpots"). In these highly localized areas individual or small groups of trees could be killed, but the overall extent is expected to be very limited. With the limited extent of tree mortality the canopy cover is expected to have a negligible change. In units that prescribed fire follows mechanical fuel reduction treatments (thinning, biomass, mastication), the ladder fuels would be removed. The elimination of ladder fuels should help keep the fire on the ground and easier to maintain the 4 foot flame length that is required by the prescription.

Vegetation management:

No mechanical vegetation management activities are proposed to occur near stream channels; therefore no direct effects are expected on anadromous fish from the implementation of the Pine Mountain project. No culverts crossing fish bearing streams are proposed for removal or replacement further reducing the risk of direct effects to fish.

There would be no loss of riparian vegetation in the action area due to the RCA buffers in place and the effectiveness of BMP in relation to timber harvest. The exclusion zone along streams will restrict mechanical equipment from within 50 feet of the streambank which would prevent impacts to riparian vegetation. The management requirement to retain hardwoods should further help protect riparian obligate hardwood species by limiting damage or removal of these species.

Mechanical treatment of general forest is proposed to occur near approximately ½ miles of Benmore creek (16% of total length). All of the proposed activities are confined to the east side of the drainage. There is a risk of sediment reaching the stream due to ground disturbance from heavy equipment. Rubber tired skidding has the highest potential to cause detrimental ground disturbance because of multiple passes over the same ground. Multiple passes by heavy equipment over the same ground can lead to detrimental soil compaction which has a low filtration rate and can lead to the erosion of bare soil and sedimentation introduce to the watershed. Heavy equipment would not be allowed closer than

50 feet from stream channels which should provide an adequate buffer to intercept and assimilate any sediment produced by vegetation management. This is particularly true on slopes with lower angles (<15%) that typically occur next to the stream. Lowered angled slopes deliver less sediment through a buffer than higher angled slopes (Elliot et al., 2010).

Operation of biomass and mastication equipment has a lower potential for soil compaction and sediment production. This is because they have much lower ground pressure and do not make multiple passes over the same ground. These are generally tracked vehicles which spread their weight out over a larger area and do not cause large areas of bare soil. Further, mastication equipment would spread the shredded material over the ground thereby increasing ground cover and reducing erosion potential. As previously noted, increasing ground cover is an effective way to minimize erosion from vulnerable areas.

Mechanical equipment operations are proposed to occur in two units #50 (8 acres) and #51 (5 acres) on the west side of the headwater of Benmore Creek. These units are located below forest road #18N05 and ¼ mile upslope of Benmore Creek between two intermittent tributaries. The RCA buffers on the tributaries and the distance upslope from the main channel should intercept and assimilate any sediment produced from these units during implementation.

General forest and hand thinning could occur along approximately one and a half mile of the east side of Benmore creek (see project map). This may occur on approximately 332 acres in unit #90. This unit has the potential to effect approximately 5000-6000 feet of headwater riparian habitat. The RCA exclusion zone and the effectiveness of BMPs should minimize any impacts to the stream channel and keep sedimentation negligible.

A part of this analysis relies on the effective implementation of BMPs. The Mendocino National Forest evaluated BMPs related to timber harvest for implementation and effectiveness; sites evaluated included skid trails, log deck landings, timber sale administration, streamside management zones, meadow protection and vegetation manipulation (e.g., mastication/shredding). From 2006 to 2010, 76 evaluations were done and 100% were found to be effective for BMPs related to landings, timber sale administration, streamside management zones, meadow protection and vegetation management. Skid trail BMPs were found to be effective at 93% of sites evaluated. Monitoring data from across the entire region was evaluated for the years 2003-2007 and found that BMPs related to timber harvest were effective 96% of the time. Four National Forests from the Cascades and Sierra Nevada reported that USFS streamside management zone BMPs were effective in preventing sediment from entering streams (Litschert and MacDonald, 2009).

Mechanical equipment operations and hand thinning could reduce general forest canopy while retaining an overall canopy of 70% in riparian reserves. As discussed above the current canopy cover in Benmore Creek is 72% (moderate) and Bucknell Creek is 90% (excellent). There could be a short term decrease in riparian canopy resulting in an increase in sunlight reaching the water, which could increase water temperatures. The RCA exclusion zone, riparian hardwood retention requirements and the riparian reserve retention requirements should reduce the risk of water temperature increases.

Road use and maintenance:

The proposed road actions have the potential to affect fish habitat through physical disturbance and sedimentation of habitat. The roads in the project area are typically outside of riparian reserves with the exception of stream crossings. Stream crossings are the areas with the highest risk of impacts to anadromous habitat in the project area. The proposed actions for roads would be confined to the existing road prism, especially at stream crossings; therefore, the risk of mortality or injury to individuals would be discountable.

Road treatments are proposed to occur on approximately 30.1 miles of Forest Service roads within the project area and those treatments include: maintenance, reconstruction, decommissioning and road closure (see proposed action). These activities would include road surface repair, maintenance and construction of drainage structures, culvert replacement and cleaning, stabilization features and improving operational access.

Road closure is the process of eliminating access to the road but maintaining drainage features and current road bed. Decommissioning of a road is more of the removal of the road footprint. This involves the removal of all streamcrossings and culverts to include the restoration of channel geometry. This also includes the effective drainage of the road-bed itself by measures such as re-contouring and outsloping to return to near natural hydrologic function. The reshaped road surface should be revegetated with native species or a minimum of 50% ground cover retained (see hydrology report).

These actions have the potential to produce short term increases in erosion and subsequent sedimentation because they involve disturbance to the road surface. Sediment from the road prism following maintenance/reconstruction is expected to be the highest in the first two years and then is expected to decrease sharply. Stafford (2011) observed a significant increase in sediment transported to the stream channel for up to two seasons following grading and/or road construction, due to ground disturbance that loosens soil and makes it vulnerable to erosion. The increased sediment should decrease after two years from maintenance of the current road system, installation of drainage features, replacement and cleaning of culverts and remediation of hydrologically connected road segments from the streams. Gravel adds surface cover to the road and holds fine sediment together in a tight matrix that is not readily erodible.

An Erosion Control Plan provides considerations and mitigations for the project to reduce off site erosion. The Erosion Control Plan is required prior to implementation of the Pine Mtn. project,and was completed by the Upper Lake, District Hydrologist in 2015. A complete description of the Erosion Control Plan can be found in the project file, hydrology report, Appendix C, page 45.

The Pine Mountain Late-successional Reserve Habitat Protection and Enhancement Project has 30.1 miles of roads in the action area. Road treatments are proposed to occur on approximately 19.3 miles of

roads that occur within the action area. The remaining 10.8 miles of roads in the action area will remain undisturbed and will not add to the effects of the roads actively used during project implementation. The table below displays the portions of roads that are not planned to be used during project implementation and will not add to the effects on TES species or their designated critical habitat.

Packsaddle creek is above Scott Dam and outside of the action area; therefore, the use of the roads in this watershed will not add to the effects to anadromous habitat. Packsaddle creek watershed contains approximately 13.7 miles of roads. The packsaddle creek roads and the roads which are not planned to be used during project implementation equal a total of 24.5 miles of total road length; therefore, only the remaining 5.6 miles of roads (19% of the total road system) in the project area have the potential to affect anadromous habitat.

Table #7: Roads in anadromous watersheds not planned to be used during project implementation.

Road number	Length of unused portion	Miles of unused road
16N29	16,762 feet	3.17
18N42	3,500 feet	0.66
18N42A	3,830 feet	0.73
18N05D	1020 feet	0.19
18N05J	2,945 feet	0.56
18N05M	2,715 feet	0.51
18N05N	660 feet	0.13
18N05P	2,160 feet	0.41
M8	4,230 feet	0.8
18N37	970 feet	0.18
18N49	2,464 feet	0.47
18N69B	1,992 feet	0.38
18N70	2,460 feet	0.47
17N40A	3,000 feet	0.57
17N35	11,499 feet	2.18
Totals	**57,182 feet**	**10.83**

Part of the analysis of effects relies on the effective implementation of BMPs. Road treatment BMPs would be implemented to ensure adverse impacts to water quality are minimized or avoided. BMPs related to road treatments were evaluated for implementation and effectiveness from 2006 to 2010. Monitoring sites included; stream crossings, slope protection, road surface drainage, decommissioning, construction of temporary roads, control of sidecast material, water source development and management of roads during wet periods. There were 84 sites evaluated and all of them had ratings from 85% to 100% effectiveness, except water source development which was found to be 75% effective (Stanislaus National Forest, 2011b). A regional summary of monitoring data between 2003 and 2007 found an effectiveness rating of 85% for road construction/engineering BMPs (USDA Forest

Service, 2012). The monitoring data demonstrates the effectiveness of regional road treatment BMPs at protecting water quality. Road treatments in the Pine Mtn. project area are expected to result in minor and short term localized increases in erosion and sedimentation.

No designated OHV trails or roads occur in the project area, however, the current level 2 roads in the project area are available for use by OHV. These roads provide access from camp sites to designated OHV trail systems. National and regional BMPs specifically designed for OHV use will be implemented and are part of the project proposed action. The BMPs for OHV should prevent adverse effects to the anadromous habitat due to project implementation.

A road inventory was conducted in 2015 to determine hydrologically connected segments (HCS) of unpaved roads that deliver sediment directly to streams during storm runoff events. The HCS protocol (Frazier and Grant, 2006) identifies HCS for each road and ranks the severity of impact based on the frequency and volume of sediment delivered. The survey identified 23 road segments that were hydrologically connected which totaled 8.86 miles (46,783 feet) of road (see hydrology report). The road system in the project area was found to be 29% connected to the watersheds (see hydrology report).

One potential drafting site was identified in connection with anadromous habitat and it is located at the Eel River crossing of the M1 road (see map, Appendix A). The following project design features will apply to water drafting sites:

- Locate water drafting sites to avoid adverse effects to in-stream flow and depletion of pool habitat.
- Streambank and in-channel excavation will be kept to a minimum.
- Use pumps with low entry velocity (350 gpm) to minimize removal of aquatic species.
- Use screening devices on water drafting pumps to avoid juvenile fish removal.

Screen mesh criteria:
Screen mesh must be in good repair and present a sealed positive barrier effectively preventing entry of the “design fish” into the intake. The design fish in this case is an immature (20-30mm) salmon or steelhead fry.
Screen mesh size shall be:

- Round openings – max. 3/32 inch diameter (.09 inch)
- Square openings – max. 3/32 inch diagonal (.09 inch)
- Slotted openings – max. 1/16 inch width (.07 inch)

B. Cumulative Effects

The spatial bounding of the cumulative effects analysis area is restricted to the Action Area. This bounding was chosen because the effects of the proposed actions would be limited in intensity and duration, and would not likely be detectable downstream of the project area. Since the loss of riparian vegetation and loss of canopy cover are only applicable at the level of the treatment unit, their effects

would limited to the project area. There is a slight risk of an increase of sedimentation from some of the proposed actions. However, this risk is relatively small and the observable effects would likely be undetectable downstream of the project area.

The temporal bounding of the cumulative effects analysis area was chosen because the project hydrology report indicated through Cumulative Watershed Effects (CWE) modeling that the effects from this project would not be detectable after ten years.

In order to understand the contribution of past human actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the cumulative impact of all prior human actions that have affected the environment and might contribute to cumulative effects. This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. By concentrating on existing conditions we are sure to capture all the residual effects of past human actions, regardless of which action contributed those effects.

The Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

The cumulative effects analysis in this (EA or EIS) is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008).

For these reasons, the analysis of past actions in this section is based on existing environmental conditions.

Two continuing actions were identified that could cumulatively add to the adverse effects on aquatic habitat. They are livestock grazing on the Pine Mountain and York Cabin Allotments, and continued OHV use of the road system within the project area.

The project area is within the Pine Mountain and the York Cabin Allotments. The permittees currently operate on these allotments, with 46 head of cattle on York Cabin allotment and 52 head of cattle on Pine Mountain allotment. The permittees work closely with the USFS, Upper Lake Ranger District to regulate the rotation of animals and release their animals in different areas of the allotment separated from south to north. Since allotment use has remained relatively constant, it is assumed that the existing conditions of the streams in the action area represent the combined effects of all past actions and natural factors, including grazing.

Benmore Creek show a lack of riparian vegetation that could be used for browse, with riparian canopy cover running between 46% and 88% with the anadromous reaches showing less than 75% canopy

cover. The lack of extensive browse along Benmore Creek suggests that there is little reason for cattle to congregate in the riparian areas, except for water. Given the lack of forage adjacent to the stream and the good quality of available forage in the nearby glades (i.e., Montgomery glade), the effect of livestock grazing relative to sedimentation is expected to be minor and short lived.

The upper reaches of Benmore Creek have steep banks and the stream is confined to a narrow V-shaped canyon. This type of topography makes it very difficult for livestock to gain access to the stream and naturally limits grazing intensity. Since Benmore and Bucknell Creeks are a known water source for cattle, there is some evidence of trailing paths to and from the streams. These paths are considered to have a small impact to the stream channels due to the dense forest in the upland, steep canyon walls, poor access to the channels and a fairly stable stream bank armored with rock.

Cumulatively, livestock grazing on the Pine Mountain and York Cabin Allotments are not expected to contribute to the direct and indirect effects of the proposed action to the extent that would exceed the fine sediment threshold that was identified in the hydrology report.

The Pine Mountain area has an extensive OHV trail system that spider webs its way through the action area. The use of this trail system is expected to remain the same as it has been in the past. Currently the system adds a minor amount of sediment to the stream systems from recreational use and trail maintenance.

The Upper Lake Ranger District Hydrologist modeled the cumulative watershed effects (CWE) for the HUC 7 and HUC 8 sub-watersheds in the project area (see hydrology report). These sub-watersheds are Benmore, Dashiell, Lower Bucknell, Upper Bucknell, Packsaddle and Willow (see hydrology report). The CWE methodology uses constant features and past, ongoing and future land management actions to evaluate equivalent roaded area (ERA).

The ERA assigned to the past, ongoing and future actions are compared to a threshold established for the watershed of concern. If the threshold is exceeded or closely approached the cumulative effects of all actions may begin to result in channel alteration. These alterations could cause stream bank instability and channel incision, which may result in erosion and sedimentation to the watershed. If detrimental alterations occur, it would be assumed that essential habitat elements required by anadromous fish may also be adversely affected. Conversely, if the threshold for watershed effects is not exceeded or remains below the threshold, there is very little risk that the habitat would be adversely affected.

Table #8. 7thfield CWE analysis %ERA values, Threshold of Concern (TOC) is 12%.

Watershed	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Upper Bucknell Cr.	1.48	2.32	2.32	2.13	2.32
Lower Bucknell Cr.	1.23	2.28	2.28	2.15	2.28

Benmore Cr.	4.14	7.75	7.74	5.99	7.56

The ERA values for all of the sub-watersheds in the cumulative effects analysis area were calculated well below the threshold of concern. Most sub-watersheds showed a spike in ERA values after project implementation, but remained well below the established threshold of concern. The ERA analysis values for all of the sub-watersheds are expected to return to pre-project levels within ten years (see hydrology report).

Alternative 3 (Preferred Alternative) No new temporary road construction

A. Direct and Indirect Effects

Fuels treatment:

The proposed fuel treatment actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

Vegetation management:

The proposed vegetation management actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

Road use and maintenance:

The proposed actions for roads under Alternative 3 is essentially the same as the proposed action (Alternative 2); with the exception of no new temporary road construction in Bucknell Creek. The proposed road segment is ¼ mile long (1320 feet) and is located in Bucknell Creek watershed, within the Action Area. The reduced road work should result in a large reduction in ground disturbance and less sediment delivered to streams, when compared to the proposed action. The reduction in ground disturbance and sedimentation should make this alternative slightly more beneficial to anadromous fish and their critical habitat, when compared to the proposed action.

B. Cumulative Effects

Cumulative effects for this alternative are the same as in the proposed action (Alternative 2), with the exception of the Benmore Creek watershed. The hydrology report showed that without the creation of new temporary roads in Benmore Creek that the ERA reduced from 11.53 to 11.51, which is a fairly

insignificant difference. The changes in anticipated cumulative effects are so small that the cumulative effects should be similar to those in the proposed action (Alternative 2).

Alternative 4 (No thinning above 10" DBH in Riparian Reserves)

A. Direct and Indirect Effects

Fuels treatment:

The proposed fuel treatment actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

Vegetation management:

The difference between this alternative and the proposed action is the removal of logging equipment for log removal in the riparian reserve. The action area is confined to Benmore and Bucknell Creeks, which have no log removal proposed in near stream habitat; therefore, the difference in effects between this alternative and the proposed action is insignificant. Since the difference is insignificant the direct and indirect effects for this alternative are the same as the proposed action (Alternative 2).

Road use and maintenance:

The proposed road use and road maintenance actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

B. Cumulative Effects

Overall differences in effects between this alternative and the proposed action are so small, that the cumulative effects should be similar. The cumulative effects for this alternative should be the same as the proposed action (Alternative 2).

Alternative 5 (No thinning above 10" DBH in known Northern Spotted Owl nesting habitat)

A. Direct and Indirect Effects

Fuels treatment:

The proposed fuel treatment actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

Vegetation management:

The changes in alternative 5, when compared to the proposed action (Alternative 2), occur outside of the riparian and away from stream habitat; therefore, the direct and indirect effects are the same for this alternative as they are for the proposed action (Alternative 2).

Road use and maintenance:

The proposed road use and road maintenance actions for this alternative are identical to the proposed action (Alternative 2); therefore, the direct and indirect effects of this alternative are the same as those for the proposed action.

B. Cumulative Effects

Overall differences in effects between this alternative and the proposed action are so small, that the cumulative effects should be similar. The cumulative effects for this alternative should be the same as the proposed action (Alternative 2).

VII. Determination of Effects

A. Threatened, Endangered, Proposed, Candidate species and their designated critical habitat

The Action area is located below Scott dam and is in the geographic range for the **CC Chinook salmon ESU**, **SONCC Coho salmon ESU,NC Steelhead DPS, and critical habitat for SONCC Coho salmon**; therefore, it is my determination that the Pine Mountain Late-Successional ReserveHabitat Protection and Enhancement Project"May affect, not likely to adversely affect" the CC Chinook salmon ESU, SONCC Coho ESU, NC Steelhead DPS and critical habitat for SONCC Coho salmon.

B. Forest Service Sensitive species

The project area is within the elevation and geographic range of the **Pacific lampreyand Western Brook Lamprey**, but a very small amount of acres are being affected and the species is not present during implementation; therefore, it is my determination that the Pine Mountain Late-Successional ReserveHabitat Protection and Enhancement Projectwill not affect the Pacific lamprey or the Western Brook Lamprey.

The project area is within the elevation range but not in the geographic range of the **Clear Lake Hitch** or the **Hardhead**; therefore, it is my determination that the Pine Mountain Late-Successional ReserveHabitat Protection and Enhancement Projectwill not affect the Clear Lake Hitch or the Hardhead.

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Appendix A: MAPS
Appendix B: Description of Unit Prescriptions
Appendix C: BMP list